Bill Mattingly Heads Chrysler Core E/E Engineering

Chrysler and Mercedes Work Closely

Electrical engineering at Chrysler was recently reorganized as a centralized core engineering group under the leadership of Bill Mattingly. In the past, electrical engineering at Chrysler was managed from within the vehicle development product teams: Jeep, small car, large car and truck. "This is a huge enabler for the electrical engineering community at Chrysler Group," declared Mr. Mattingly, "to now be able to focus our resources and align ourselves with Stuttgart so we can jointly engineer products much faster and more efficiently.

Human nature dictates that if you have five different engineers working on five different products, you'll get five different solutions. Now all those efforts will be coordinated."

With headquarters at the Chrysler Technical Center in Auburn Hills, Michigan, the new organization almost exactly matches the core E/E organization managed by Stephan Wolfsried, vice president passenger car electrical/electronics at Mercedes-Benz in Stuttgart. "By having the organization almost identical to the one in Stuttgart, the directors can have joint meetings on a regular basis to coordinate projects," M r. Mattingly told us. He believes the new organization will save DaimlerChrysler money in two ways. First, it will maximize unit volumes and minimize stronger better training. Second, as the two engineering groups work closely together, they will minimize redundancy—more development work will be accomplished with the same number of engineers.

At GM and Ford, powertrain electrical engineering is kept separate from non-powertrain electrical engineering. The Turn to Chrysler, page 2

Carmakers Seek Copper Alternative to Fiber-Optic MOST

While the MOST (Media Oriented System Transport) optical fiber data bus has been gaining popularity in Europe, where at least 20 models including the Mercedes E class sedan are now produced with the optical data communications link, Mercedes says it no longer wants to use fiber optics. "My goal is to get rid of that optical bus and take the [MOST] protocol in copper wiring," declared Stephan Wolfsried, DaimlerChrysler vice president in charge of electrical and electronics engineering at Mercedes. Dr. Wolfsried has told his suppliers, including Harman Becker and Siemens VDO Automotive, to "switch to copper as soon as possible." A cording to Dr. Wolfsried, moving to a copper (or electrical) physical layer is a common goal in the MOST Co-operation.

Some difficulties with fiber optics began showing up at Mercedes dealers. "The optical bus is very challenging because it is difficult to diagnose mechanical damage such as dentsing the cable. ... Each connector can be connected and disconnected only five times maximum. That is not enough," noted Dr. Wolfsried.

Peter Haeussermann, who works for Dr. Wolfsried and is responsible for much of the electronics installed in M ercedes vehicles, further described what is at issue: "If you repair a vehicle and replace some components you may run into this problem, since maybe not all the dealers are so well trained. ... We want to make our systems as robust as we can. ... That is why we would like the copper solution, which is much easier to deal with."

Volkswagen's top E/E, Karl-T homas Neumann, also expressed interest in a copper alternative to fiber optics. Other carmakers will follow, according to Cary Wilson, formerly Ford's top electrical engineer, now vice president in charge of automotive systems engineering at Panasonic Automotive Systems of America. "If copper can be used, then most carmakers will probably go that way," M r. Wilson predicted.

Carmakers adopting the MOST protocol chose fiber-optic rather than electrical networks to carry high-speed digital audio and video signals in multimedia applications because sending high-speed signals on copper wire would interfere with other electronic devices installed in the vehicle. High-speed digital transmisions on copper can produce a lot of electronic noise, as copper wire radiates electromagnetic energy, especially when the cable is long. And copper wiring is susceptible to picking up stray noise from other parts of the car. For example, Dr. Erich Geiger, chief technical officer for Harman International and president of Harman Becker Automotive, noted, "If you have very strong magnets in the car, like in hybrids, Turn to MOST, page 3
same was true at Chrysler until recently, but the reorganization brought powertrain electrical engineering into Mr. Mattingly's core E/E organization. While Glenn Denomme, the director of powertrain E/E, reports directly to Floyd Allen, vice president of Chrysler's powertrain product team, he also has a dotted-line relationship to Mr. Mattingly. Mr. Mattingly believes that will help Chrysler present a cohesive face to semiconductor and tier-one electronics suppliers. He also told us: "Glenn Denomme works with me on the front end of the projects relative to technical strategy, but the key reason to have him report directly to powertrain is to maximize the efficiency of the overall cost of the powertrain system. For example, sometimes putting an extra $10 in the engine controller can save you $40 in the exhaust catalyst."

**More Common Parts**

Mercedes-Benz and Chrysler have been keen to use common parts for whatever doesn't distinguish one brand from another. According to Mr. Mattingly, "That's anything that is indistinguishable or unseen by the driver. For anything that is done to satisfy a base feature or a federal regulation, it's guaranteed we will work cooperatively on those. The customer sees no value in them. They expect them and won't pay extra for them," he said. "We've had tremendous success doing joint development with our colleagues in Stuttgart," said Mr. Mattingly. Chrysler and Mercedes-Benz have already developed a number of common parts: memory seat modules, steering column modules, airbag electronics modules and ABS modules. Often the two engineering groups split projects up into multiple pieces and the work is done by engineers on both sides of the Atlantic. Aburn Hills and Stuttgart take turns as program leaders. "Oftentimes a Mercedes vehicle will have more functional loading than a Chrysler Group vehicle. Stuttgart might take the lead on the high line version and we take the low line and share the results with each other," he explained. Chrysler and Mercedes are currently working on common powertrain modules.

**More Outsourcing, Except for Body**

Like the European carmakers, Chrysler has been more inclined over the past few years to source from system suppliers who also handle much of the systems engineering. However, engine management has been the exception—for that Chrysler has held on to system engineering responsibility. Since the reorganization, Chrysler has decided to outsource even some engine control components. "Let's face it—the basic fuel and basic spark algorithms are no longer intellectual property. It's the control components. "Both Stuttgart and Chrysler Group believe that body is a part of the vehicle we want to control, where we want to set the partitioning," said Mr. Mattingly, adding, "We want to own the body systems, because that's what the customer identifies with. We want to maximize the content in the body in line with each vehicle's brand identity."

Four senior E/E managers have dotted-line responsibility to Mr. Mattingly but report directly to the vehicle teams: premium, small vehicle, truck and family vehicle. They handle wiring, program control and launch coordination. "There was a strong need to keep the wiring harness design in the product teams," said Mr. Mattingly. "The wiring harness is one of the few parts you can't commonize. All the product teams get their wiring strategy from Al Pizzimenti's organization: program management and advanced packaging. He runs the wiring center of competence, which covers wiring components and process."}

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**Chrysler's Core E/E Group**

| **Bill Mattingly** |
| Vice President, Engineering Core |
| Reports to **Eric Ridenour**, Executive Vice President, Product Development |

**Mr. Mattingly's direct reports:**
- **Marty Yagley**
  Director, Audio, Telematics and Information Systems
- **Dr. Ralf Voss**
  Director, Body and Safety
- **Wilfried Achenbach**
  Director, Chassis Control Systems and Architecture
- **Al Pizzimenti**
  Director, E/E Program Management and Advanced Packaging

**Mr. Mattingly's dotted-line reports:**
- **Glenn Denomme**
  Director of Powertrain E/E
- **Mike Swiek**
  Manager, Small Vehicle E/E
- **Glenn Forshee**
  Manager, Premium Vehicle E/E
- **Kevin Mets**
  Manager, Truck E/E
- **John Gates**
  Manager, Family Vehicle E/E
you have to take precautions." By converting the electrical signals to optical signals for transmission across the vehicle through fiber-optic cables, electrical noise is eliminated.

With the benefit of a few years of experience with fiber-optic cables in production vehicles, some carmakers have found that optical cable and connectors present their own set of problems, namely, they are susceptible to damage in manufacturing and in service. These carmakers and some who have been reluctant to take on fiber optics are looking for alternatives.

In early June 2003, the MOST Cooperation set up a working group called Electrical Physical Layer (ePhy) to address the members’ interest in implementing the MOST protocol on copper wire. The ePhy working group was initiated by and is led by a representative from Toyota. Toyota appears to want to take advantage of the MOST networking protocols, but only if it can do so without using fiber optics. Other ePhy participants include Panasonic, Harman Becker, Yazaki, Oasis Silicon Systems, Honda, V W, DaimlerChrysler, Ford and Volvo, among others. The ePhy working group aims to replace the fiber-optic cable, connector, optical receiver and transmitter with either shielded or unshielded copper twisted-pair wiring, automotive grade electrical connectors and an electrical transmitter and receiver.

Two Proposals Under Consideration

Switching to copper can’t happen until a solution to the electromagnetic compatibility problem is found. The working group is debating the pros and cons of two possible electrical methodologies. One proposed by Harman Becker uses shielded twisted pair copper wiring; the second, promoted by Panasonic, is built on unshielded twisted pair. While unshielded twisted pair would be cheaper and easier to handle, it is more likely to cause electromagnetic susceptibility and interference problems. That problem could be solved with additional electronics, but adding components could bring the system cost close to the cost of using shielded wire.

Harman’s approach, which company spokesmen refer to as "MOST differential," is designed to minimize electromagnetic compatibility problems by keeping the shape of the MOST electrical signals as close as possible to the shape of the MOST fiber-optic signal. Using shielded cable will keep the electronics simple and inexpensive. Harman has been demonstrating its electrical MOST solution in a Porsche 911, running MOST at 22.5 Mbps on copper. (Fiber-optic MOST systems today operate at speeds up to 24.8 Mbps; 50 Mbps systems are being tested.) Harman chose the Porsche as a test vehicle because the engineers felt its compact size and the proximity of antennas to the engine would exaggerate any potential noise problems. The vehicle, which can be road tested, shows no signs of EMI problems, according to Harman.

A according to Harald Schöpp, director of electronics system design for Harman Becker, his company’s proposal deals not just with using the proper components and circuitry to minimize EMI. It also addresses testing procedures and debugging tools.

Toshi Kurosaki, a Panasonic engineer helping to develop an electrical physical layer for MOST, told us recently that no Japanese carmakers are currently planning to use optical MOST in production. Why? Unlike the Europeans, Japanese carmakers like to break up the vehicle’s wiring harness into a few sections that can easily be brought to the vehicle for connection during assembly. That would necessitate a number of optical connections, which the Japanese see as harder to implement than electrical connections.

Designed for low noise emission at 50 Mbps, Panasonic has proposed its X-LEI design, which stands for X-value Low Emission Interface. X-LEI is based on the same digital transmission technology used in cable television to keep each channel from interfering with neighboring channels. Panasonic envisions an LSI (large scale integrated) circuit with differential 8-value mapping, digital low pass filter, digital-to-analog and analog-to-digital converters. Please see the figure, below.

No Quick Changeover to Copper

The MOST specification encompasses both hardware and the software required to implement a multimedia network. Changing the physical layer of the network from optical fiber to copper does not require any changes in the software layers. Carmakers who implement the MOST... continued on page 8
The Company Profile... AMI Semiconductor

**Headquarters:** 2300 Buckskin Road, Pocatello, Idaho 83201 USA; telephone: 208-233-4690; fax: 208-234-6795; www.amis.com

**European Headquarters:** Westerring 15; B-9700 Oudenaarde, Belgium; telephone: 32 55 33 22 11; fax: 32 55 31 81 12

**Products:** Application specific integrated mixed-signal (analog plus digital) semiconductor products

**Target Markets:** Automotive, medical and industrial

**2002 Sales:** $345.3 million, which includes the third and fourth quarter sales of Alcatel Microelectronics Mixed Signal Business, acquired by AMI in June 2002.

**2002 Net Income:** $5.1 million

**R&D:** 15.1% of sales

**Full and Part-Time Employees:** 2,528 as of June 28, 2003

**Design Engineers:** 220 as of June 28, 2003

**2002 Automotive Sales:** $85.2 million

**Top Automotive Customers:** In order of sales, Johnson Controls, Siemens VDO Automotive, Hella

**Key Automotive Products:** ASICs (application specific integrated circuits) account for 91% of automotive sales; ASSPs (application specific standard products) account for 9% of mixed-signal sales.

**Major Automotive Applications:** Body and vehicle control applications account for 42% of sales; driver information applications account for 33% of sales.

**Background**

With over thirty years of experience and an extensive intellectual property portfolio, AMI Semiconductor (AMI) designs and manufactures analog and mixed-signal application specific integrated circuits (ASICs). AMI Semiconductor's products respond to electronics developers' demand for reduced integrated circuit size by combining analog and digital functions into one integrated circuit. Customers also look to AMI to incorporate their technology along with AMI technology into the IC.

AMI focuses not on standard products, but on application specific products—designed for a specific customer or a specific application. AMI serves the automotive, medical and industrial markets, which have significant analog interface requirements, the area where AMI has expertise.

Currently a wholly-owned subsidiary of AMI Holdings Inc., AMI has had several owners and investors in its 37-year history. Founded in 1966 as American Microsystems Inc., in Santa Clara, California, the company was taken public in 1968. The company was acquired by Gould Inc. in 1982. After Gould was purchased by Nippon Mining Company in 1988, American Microsystems was spun off as a separate entity. In 2000, U.S. investment bankers acquired a majority interest in the company, which was renamed AMI Semiconductor Inc., or AMIS.

The new owners incorporated AMI Holdings Inc., the parent company, in Delaware. AMI Holdings has three primary stockholders, Citicorp Venture Capital (CVC), Francisco Partners and Japan Energy Electronic Materials Inc., who owned approximately 38.8%, 38.8% and 19.6% of the company respectively, before it was taken public in August 2003. The three major investors' combined ownership was 63% after the initial public offering (IPO).

At year-end 2002 AMI Holdings Inc. and subsidiaries' balance sheet showed good liquidity. With current assets of $199.6 million and current liabilities of $84.9 million, the company's current ratio was 2.4 to one.

For the six months ending June 30, 2003, the company posted a net loss of $5.5 million, compared with a net loss of $3.6 million in the same period a year before. Revenue was $211 million in the first half of 2003, compared with $139 million in the same period in 2002.
AMIS Sales by Market and by Product
Total 2002 Pro Forma Sales: $400.4 million*

By Market
- Computing, Consumer and Other, 12.9%
- Automotive, 25.1%
- Military, 8.6%
- Medical, 11.2%
- Communications, 20.0%
- Industrial, 22.2%

By Product
- Structured digital products, 21.2%
- Mixed-signal foundry services, 24.0%
- Integrated mixed-signal products, 54.8%


AMIS Automotive Sales in $ Millions

<table>
<thead>
<tr>
<th>Year</th>
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<tbody>
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<td>1999</td>
<td>21</td>
</tr>
<tr>
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<td>2001</td>
<td>28</td>
</tr>
<tr>
<td>2002</td>
<td>85.2*</td>
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*Includes $46.2 million in automotive sales of Alcatel Microelectronics Mixed Signal Business (MSB).

IPO
On August 15, 2003, AMIS Holdings Inc. filed with the U.S. Securities and Exchange Commission (SEC) for a $600 million IPO. The company began trading on September 24th at $20 per share, on Nasdaq under the symbol AMIS. As of October 6, 2003, AMIS was trading at $19.65 per share. With 71,865,008 shares outstanding, the market valued the company at $1.4 billion. Credit Suisse First Boston and Goldman Sachs, with the assistance of Lehman Brothers, handled the IPO. Merrill Lynch, UBS Investment Bank, SoundView Technology Group and U.S. Bancorp Piper Jaffray were also listed as underwriters.

Now that AMIS is publicly funded, the company expects to have more capital with which to make acquisitions. “Currently we are looking at anything that is synergistic with our stated strategy, which says we want to be a leading supplier of mixed-signal solutions to the automotive, industrial and medical markets,” said Bob Klosterboer, senior vice president in charge of integrated mixed-signal products at AMIS.

The company is organized into three product areas: integrated mixed-signal products, mixed-signal foundry services and structured digital products. Mixed-signal ASICs, characterized by long lifecycles (five to seven years, on average) and stable prices, account for over half of total mixed-signal sales and 91% of the company’s mixed-signal sales to the automotive industry. AMIS also provides foundry services based on mixed-signal process for other semiconductor designers and manufacturers. In 2002 over 85% of foundry services pro forma net sales came from the manufacture of mixed-signal ASICs. Including foundry services, over 70% of the company’s 2002 pro forma sales involved analog and mixed-signal devices.

Along with structured digital products, including ASICs and standard cell devices, AMIS offers its customers ASIC conversion services using proprietary methodologies, software tools and manufacturing expertise. Programmable logic ICs and FPGAs (field programmable gate arrays) can be converted to more cost-effective structured digital products that deliver higher processing speed, consume less power and offer higher levels of integration.

Business Strategy
AMIS wants to become the leading supplier of mixed-signal and medium-complexity digital ASICs in each of its target markets: automotive, medical and industrial. The company strategy emphasizes these elements:

- Leverage systems knowledge as well as mixed-signal and digital expertise to expand market share in target markets.
- Develop foundry customers to provide stable cash flow.
- Make strategic acquisitions that increase share in target markets, improve AMI Semiconductor’s portfolio of intellectual property and strengthen its customer base.

Acquisition of the Mixed-Signal Business of Alcatel Microelectronics
On June 26, 2002, AMI Semiconductor acquired the mixed-signal ASIC business (MSB) of Alcatel Microelectronics N.V. from STMicroelectronics N.V. According to AMIS, the acquisition increased the company’s analog and mixed-signal engineering team from 98 to 170 engineers and provided two wafer fabs in Oudenaarde, Belgium. The MSB acquisition also enhanced AMIS’s relationship with major European customers and provided AMIS with additional high-voltage and wireless technologies. Since the acquisition, 169 positions have been eliminated, which combined with other reductions yielded $41 million in cost savings on an annualized basis. AMIS paid $79.4 million for MSB, plus expenses. In addition, AMIS paid approximately $4.4 million in restructuring costs in 2002. The acquisition of MSB significantly increased AMIS’ position in the automotive industry, more than doubling automotive sales.

continued on following page
AMIS Automotive

According to company literature, mixed-signal semiconductors “interpret and manage analog inputs such as light, heat, pressure, power and radio waves. [T]hese signals can be] processed by digital control circuitry and used to drive devices such as motor controllers or industrial switches or to communicate with an external system. Integrated mixed-signal products combine analog and digital semiconductor functionality on a single integrated circuit.”

In terms of sales, the automotive market represents AMI Semiconductor’s largest group of customers for mixed-signal devices. We asked Bob Klosterboer why automotive customers buy from AMIS rather than from its competitors. He replied, “Our ability to integrate distinguishes us. Although there are companies out there that can do what we do, there aren’t a lot of companies that have the kind of process capabilities and the [design] portfolio to do system level integrated circuits. ... One of the cornerstones of that differentiator is our system architects, who sit down with our customers and help them define exactly what the system should look like.” Often working at the customer’s location, system architects help to optimize product performance and keep costs down. AMIS employs seven automotive system architects in North America and six in Europe.

Another advantage in winning automotive business is the company’s sensor interface capability, especially the ability to interface to a wide range of sensors with precision analog front ends, Mr. Klosterboer told us. AMIS has a great deal of experience designing automotive circuits that interface with pressure, temperature, yaw and magnetic field sensors. “We can design analog front ends with extremely low leakages and extreme stability over the temperature range,” explained Mr. Klosterboer. AMI Semiconductor’s sensor interface devices are often located in the engine compartment, so they must be able to withstand temperatures up to 150 degrees C and even up to 160 degrees C in some instances.

AMIS is focusing its market development efforts on tier-one suppliers whose products fit applications where AMIS has been successful—areas such as pressure and yaw rate sensing, motor control and airbag applications. A naural position sensors, including pedal and throttle-position sensors, are also important.

AMIS’s strategy fits well with the automotive market. The company maintains a flexible and modular manufacturing approach that can provide low cost solutions “whether the customer needs 50,000 pieces a year or millions of pieces,” declared Mr. Klosterboer. “We are continuing to build 5-micron and 7-micron technologies in our fabs. Our customers ask us to guarantee five, seven and even ten years of product life. Our manufacturing is set up so we can run a lot of different processes. We can run a process module in a 3-micron geometry, and we can run the same module in a .8- or .5-micron geometry,” he added.

Key Automotive Processes

From the acquisition of Alcatel’s mixed-signal business, AMIS picked up its two most important automotive processes, I3T80 and I3T50. I3T stands for Improved Intelligent Interface Technology.

Introduced in September 2002, Bob Klosterboer called I3T80 the company’s future workhorse in automotive applications. “The capabilities of the I3T 80 will draw customers to AMIS. It handles 80 volts, which means we can directly drive actuators, including motors, and handle 42-volt applications. We can take a signal off a LIN bus, for example, and drive a headlamp motor or some other type of motor directly. Or we can take a piece of information like stability or temperature, do some calculations on it and put it out on the bus,” he said. With on-chip Flash memory development underway, AMIS is currently accepting design projects involving Flash.

Top Automotive Customers Ranked by Sales

For the first six months of 2003
Johnson Controls
Siemens VDO Automotive
Hella
Others (alphabetically)
Bosch
Delphi
Texas Instruments
Valeo

AMI Semiconductor's Key Automotive Products

Analog and mixed signal ASICs
Transceivers
Wireless transceivers
Motion controllers

AMI Semiconductor

First 6 Months 2003 Sales: $56.6 Million

- Safety and convenience, 6%
- Powertrain, 15%
- Driver information, 33%
- Body and vehicle control, 42%

Key Automotive Applications/Products

- Sensor interfaces: for tire pressure, yaw rate, pedal position, compass and braking
- High-voltage drivers: for headlamp motors, fuel injectors, lamp drivers and airbag squibs
- Transceivers: for in-vehicle networks including VAN, LIN, and low- and high-speed CAN

AMI Automotive Sales by Application

2002 Automotive Sales: $85.2 Million*

- ROW, 18%
- Europe, 52%
- North America, 30%

The second in AMI Semiconductor’s series of I3T mixed-signal technologies, I3T 50, was introduced on May 16, 2003. The I3T 50 process allows designers to integrate complex digital and precision analog circuitry, embedded microprocessors and high-voltage functionality into a single IC. AMIS says that the process is ideal for a variety of applications such as sensor interfaces, transceivers and motor drivers. In developing I3T 50 technology, AMIS employed a proprietary deep trench isolation (DTI) technique that allows isolation distances between two high-voltage devices to be dramatically reduced. As a result, the chip area of an I3T 50 ASSP (application specific standard product) is somewhere between 10% and 60% smaller. I3T 50 offers logic gate densities of 15,000/mm² and can be used to create smart power SoC (system on chip) devices with gate counts as high as 500,000.

In addition to the digital logic, these devices can incorporate high-voltage circuitry such as motor controller drives, DC/DC converters and high-precision analog circuits including band gap filters, analog-to-digital converters and digital-to-analog converters. The new 50V smart power technology is built around the AMIS low voltage 0.35µ CMOS semiconductor process that features metal-metal capacitors and well-matched high-ohm resistors.

Improving the capability of the basic I3T process is the most important development AMIS has going today. Hervé Branquart, worldwide strategic marketing manager, explained: “We are adding high voltage modules to the CMOS process and developing the IP [intellectual property] blocks we need, for example, a CAN interface, a LIN interface and a wireless RF interface.” I3T improves upon the I2T predecessor process. The technology combines BICMOS (bipolar complementary metal oxide semiconductor) with DMOS (diffused metal oxide silicon). “Diffused components float, they are not referenced to the ground, which means you can handle up to 100 volts,” Mr. Branquart said.

AMIS is also developing wireless capability. “We are working on an application circuit, which today is used in industrial applications at 433 megahertz and 868 megahertz. Similar wireless circuits could be brought to the automotive market in the form of ASSPs (application specific standard products). Remote tire-pressure sensing is one possible application,” noted Mr. Klosterboer. “A wireless IC could be used anytime you don’t want to run wires, for example, from a transmission sensor to another part of the vehicle,” he said.

AMIS Bases Its Business on These Capabilities
- Mixed-signal engineering and system level design expertise
- Extensive library of proprietary mixed-signal building blocks
- Proven process technologies
- Flexible manufacturing model

AMIS invested $52.1 million or 15.1% of sales in R&D in 2002. A prospectus prepared for AMI Semiconductor’s IPO states: “Our research technology efforts focus on process technology, design methodology and intellectual property for mixed-signal ASICs and digital conversion products. As a result we have implemented improvements to our manufacturing processes, design software and design libraries, including releasing our 0.35-micron ASIC, 0.5-micron mixed-signal and 0.35-micron high-voltage processes and libraries.”

AMIS Cites These Competitive Strengths
- Design and manufacturing expertise: The company has been a leader in analog and mixed-signal design and manufacturing for over 30 years. Analog and mixed-signal engineers require more training than digital engineers because mixed-signal ASICs are more complex to design than digital ASICs.
- System-level expertise: The company employs systems architects with end-market expertise to optimize ASIC designs according to customer needs.
- Extensive library of building block circuit designs: AMI Semiconductor’s library includes a significant collection of analog and mixed-signal circuit designs customized for applications in the company’s target automotive, medical and industrial markets. The company has a portfolio of over 230 pending and granted patents in the United States and abroad.
- Strong relationships with a diverse base of customers: AMIS prides itself on close collaboration with its customers and a thorough knowledge of the customers’ end markets. Many customers use AMI Semiconductor’s engineering and design capability as an extension of their own research and development groups. AMIS has a diverse base of customers, with the 19 largest accounting for the majority of 2002 pro forma net sales. A catel, at 5.2%, was the only customer to account for more than 5% of sales in 2002. AMIS believes it is the sole source provider of approximately 85% of the products it sells.
- Proprietary process and manufacturing technology: The company focuses on making long lifecycle mixed-signal and digital semiconductors using established proprietary processes including precision analog and high-voltage technologies. AMIS is ISO 9001, QS 9000 and TS 16949 certified.
- Support of products with long lifecycles: AMIS believes it is one of a very small number of service-oriented manufacturers willing to support customer manufacturing needs over product lifecycles of ten years or more.
Speech Recognition Progresses Gradually

Like most new automotive technologies, speech recognition is coming to market much more slowly than early advocates expected. Carmakers like speech recognition because it promises to make driving safer and more comfortable. Instead of fumbling around looking for the right switch, joy stick or touch screen panel, many drivers will find it easier and less distracting to command features simply by speaking. Ultimately, says ATX speech expert Thomas Schalk, speech technology will reach the point where drivers will seek directions by talking to computers “as if they had a person along who really knows the area telling them where to turn and what to look for.”

In another future speech-recognition application, drivers will safely converse with spoken audio websites to keep themselves entertained and informed while stuck in traffic.

A few simple speech-recognition systems are already being used by drivers, for example, in Chrysler’s U Connect telematics platform, which features ScanSoft or IBM speech systems. Visteon’s Bluetooth M ach Voice Link hands-free dialing unit is installed on BMWs and Jaguars. Honda Accord s and Acura MDXs have IBM speech recognition built into their navigation systems. Harman Becker’s Tem ic Speech Dialog Systems are installed in Mercedes, BMWs, Audis, Fiats and Range Rovers to command radios, CD and DVD players, TVs and/or HVAC systems. Denso makes navigation equipment that features its own speech recognition engines. Denso navigation equipment has been installed in Toyotas, Cadillacs, Lincoln Town Cars and Navigators.

While small vocabulary voice-command systems are feasible today, telling navigation equipment where you want to go by naming a point of interest, intersection or street address is probably the most challenging automotive speech recognition application there is. Such destination entry capability would require an extremely large vocabulary as well as a sophisticated computer with lots of memory, which today would be far too expensive to embed into the vehicle.

But in a few years, destination entry could be done using a very sophisticated computer located not on the vehicle, but at some central office. That way, map data could be more easily kept current. “It would be like talking to an operator who can figure out what you are trying to say, compute a route and download it to the car,” explained Dr. Schalk.

Getting a clean audio signal that contains just one voice is one of the challenges. Array microphones are being developed that can distinguish the driver’s voice from passenger voices. “In three years you’ll be able to buy a car that works that way,” predicted Dr. Schalk. ATX provides telematics services to Mercedes, BMW and Jaguar customers in North America.

Visteon’s Mike Bryars, senior manager for infotainment product development, says that Visteon will soon be ready with a navigation destination entry system that can handle full database spoken word access. “To do that you have to design the navigation product with voice in mind. We are moving beyond proof of principle and have plans to develop and deploy factory installed systems in calendar year 2007,” he said.

Automotive Speech Recognition Applications

Command of:
- Climate control system
- Radio, audio, CD, DVD, MP3 player
- Navigation unit
- Lights
- Locks
- Seat warmers
- Seat position
- Telephone
- Hands-free cell phone dialing and operation
- Finding and accessing traffic reports
- Finding and accessing driving directions
- Linking to information and entertainment services
- Operating a spoken word owners manual

Destination entry, by words or by spelling

M O S T...

standard will be free to use either a fiber-optic or an electrical physical layer. While a number of carmakers now favor a copper physical layer for MOST, a transition to copper won’t occur overnight—and for some carmakers, perhaps never. Harman believes some carmakers will stick with the optical bus. Plus, Dr. Geiger noted, any move to copper could only be made during platform changeovers since it would require a complete debugging of the wiring harness and the other electronics aboard the vehicle.

Harald Schöpp, who represents Harman on the MOST steering committee, cautioned, “Copper cable is not as simple to handle as it might appear at first glance. We are talking here about very high-speed multimedia, which is not comparable to what we have dealt with before with CAN or J1850. We have to deal with common mode noise, which inherently occurs when electronics parts are connected to each other. This and other problems can be solved, of course, but it involves development work and potentially also materials.” One important area where more development work is still needed involves high-speed copper connectors. While such connectors are available for the computer and consumer electronics markets, they are not sufficiently robust for the automotive environment. According to Mr. Schöpp, the earliest an electrical MOST solution based on the Harman Becker proposal could be ready for the market is 2006 or 2007.

According to Dr. Geiger, Harman will continue to make improvements in its fiber-optic technology while also developing an electrical solution. “We have significantly improved the optical interface cost-wise and reliability-wise,” he said. New glass fiber will enable higher-speed data transmission than the plastic fiber-optic cable used today, and advanced chipsets will speed up the performance of MOST on copper. Within a few years, both systems could be operating at 150 Mbps. “The customer will decide which is more well suited for his application,” Dr. Geiger said.